A Survey of Video Streaming in Mobile Cloud Computing

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Abstract— Cloud computing is gaining power as a promising technology to transform IT industry and many reputed enterprises are developing their own cloud infrastructures. Clouds are responsible for storage and computing demanding tasks, and mobile devices collocating with each other share bandwidth and cooperatively stream media content to distribute the load of mobile devices. But Mobile multimedia still poses many challenges in efficient video streaming due to the form of mobile devices. In mobile cloud video rendering and encoding is performed on cloud servers, with the resulting video streamed over wireless networks to mobile devices. For providing higher user experience in mobile devices higher bit rate is required to improve video quality and response time in video. This paper is briefly described & analyzed the role of cloud computing in mobile devices.

Index Terms— Mobile cloud computing, Iaas, paas, saas, Adaptive rendering

1 INTRODUCTION

NOW a day in mobile devices, mobile applications are emerging as a significant new application form in the next generation Internet, among which media streaming may disruptively occupy the bandwidth of mobile devices just like in wire line Internet. Future mobile devices may turn out to be mobile supercomputers as the integration of GPS, video camera, etc., with a decent battery lifetime [1]. However, current wireless Internet access technologies can only provide the choice between high average bit rate such as WiFi or WiMAX and good coverage area, but cannot guarantee both at the same time. Cloud assisted cooperative media streaming in scenarios that mobile devices cannot individually achieve a reasonable streaming rate due to bandwidth limitation [2].

The explosive growth of wireless networking, mobile computing and web technologies in the last decade has profoundly influenced society at large. Almost anyone with access to a mobile device has access to services on the Internet and has the benefits of instant accessibility to Internet-enabled technologies such as mapping applications, media streaming applications, and email [3].

Cloud computing environment enables a new framework that transfers the physical location of computation and storage into the network to reduce operational and maintenance costs. While mobile computing provides ubiquitous access of users to services, cloud computing harnesses the vast storage, computing, and software infrastructure resources into a single virtualized infrastructure [4].

2 VIDEO QUALITY OF MOBILE DEVICES

The small screen size prevents users from recognizing video content details, especially in big-screen productions. The limited bandwidth causes problems in seeking or browsing the video, because it may take a long time to load the video [5]. Previous research on mobile video quality of service has focused mostly on network latencies or bit rate adaptation. However, the perceived experience from user and content perspective is neglected. Moreover, others deal with content based video retargeting algorithms for improving mobile video User experience, but applied only to locally stored videos [6]. One major limitation is that they neglect the complexity in development of mobile video sharing applications.

3 CLOUD COMPUTING ARCHITECTURE

Cloud computing the integration of Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS), has the potential to moderate frustrations faced by mobile devices. Mobile devices send task requests to clouds, which perform corresponding operation such as resource, discover and return retrieved media content or other information [7]. Based on this storage and computing model, mobile devices may save a substantial amount of power and also overcome the defects of limited local computational and storage resources. Use of mobile cloud computing concept reduces the communication overheads between mobile devices and providers [8]. These devices go through with constrained bandwidth and occasional connectivity loss. In figure 1 over all architecture is shown for cloud computing.. Cloud computing is a better approach to support high quality 3D video to save computational power and extend battery life on mobile devices [9,10].

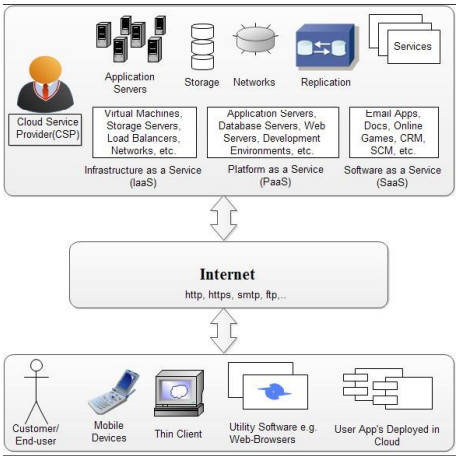

Figure 1. Cloud Computing Architecture

4 UTILIZATION OF CLOUD IN MOBILE DEVICES

As an exceptional assistance, clouds provide us with a platform to perform storage and computing demanding tasks remotely. Mobile devices send task requests to clouds, which perform corresponding operations and return retrieved media content or other information [11].

Nowadays, using mobile devices is enjoying a boom, that is required a tremendous services supported from mobile cloud. From movie and music entertainment to games, multimedia applications play an everyday role in mobile cloud.

With the help of cloud technologies, limited resource mobile devices can utilize resources from powerful servers to run high performance applications [12,13] However, those remote control platforms have limited or not support quality of service or multi connections at all multimedia applications. The mobile devices are including wireless Personal Digital Assistant (PDA), mobile phone, Smartphone (integrated PDA with mobile phone), tablet, etc [13,14]. These devices are enabling new forms of mobile computing and communication, named Mobile Cloud Computing (MCC).

MCC is emerging as one the most important branches of cloud computing, and is still in its infancy [15]. From a simple perspective, MCC can be thought of as infrastructure where data processing could happen outside of the mobile device, enabling deliver applications similar to what is found in traditional desktop computing environments with any platforms and operation system, including web browsing, email, video conferences, presentations, movie, music entertainment, (2D or 3D) games and multimedia applications [16,17].

5 CLOUD-BASED MULTIMEDIA

Cloud-based multimedia computing paradigm has emerged to facilitate the execution of complicated multimedia tasks. In the cloud-based multimedia system, users are able to store and process multimedia applications in the cloud in a distribute manner [18].

There for lighten the burden of multimedia software installation and maintenance in users' devices. Fig. 2 shows the structure for the multimedia cloud service. Quality of Service (QoS) needs to be guaranteed for the cloud-based multimedia computing applications. [19,20]. If the reliability of cloud service is low, the users will suffer failures of media services frequently and therefore lose the confidence in the cloud service provider.

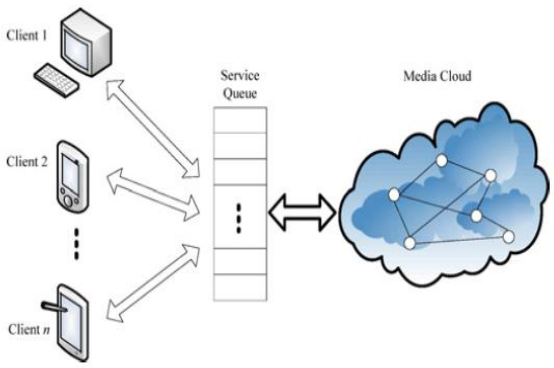

Figure 2. Multimedia cloud service structure

6 CLOUD VIDEO STREAMING METHOD

In mobile network the requirement of optimizing the quality of video delivery is necessary. The survey shows the poor service quality of video streaming over mobile network such as long buffering time and interrupt happen in the streaming video [21]. Some approaches are proposed by many researchers to improve video quality of smart phones [22]. Such as:

- **Asymmetric graphics rendering**: In this significantly reduce the video encoding bit rate needed for a certain video quality, thereby making it easier to transmit the video over wireless network. It is possible to set appropriate graphics rendering parameters according to network constraints, such that the user experience can be maintained to a high level [23,24].
- **Rendering adaptation technique**: In this technique graphic rendering work on cloud instead of mobile devices [25]. This is based on bit rate & computation load.
- **Adaptive Mobile Video Streaming** (AMoS): In cloud we use user-Adaptive Mobile Video Streaming (AMoS) and the User Behaviour Oriented Video Pre-Fetching (UBoP)[26].In this method reduces the traffic using SVC for adjust streaming. For distributing video in proper way in mobile network used private agent [27]. It shows the social interaction between the mobile users. Video quality based on feedback of link quality. Result shows that the cloud can effectively provide the video streaming and video sharing on network [28].
- **Scalable video coding** :The cloud server behaves like a SVC extractor, enabling a very large number of clients to receive live video streams at the same time by dynamically arranging available resources based on the streaming quality requested by clients. Svc standardizes the encoding of a high-quality video bit stream that also contains one or more subset bit streams [29]. The subset bit stream can represent a lower spatial resolution (smaller screen), lower temporal resolution (lower frame rate), or lower quality video signal.

- **P2P Live Video Streaming :** Cloud-based P2P Live Video Streaming Platform (Cloud PP) that uses public cloud servers to construct an efficient and scalable video delivery platform with Scalable Video Coding (SVC) technology[30]. The cloud server behaves like a SVC extractor, enabling a very large number of clients to receive live video streams at the same time by dynamically arranging available resources based on the streaming quality requested by clients [31].

7 ANALYSIS & DISCUSSION

Based on this various storage and computing model, mobile devices may save a substantial amount of power and also overcome the defects of limited local computational and storage resources. In addition, this reduces communication overheads between mobile devices and content providers. Mobile Cloud

Computing is defined as cloud computing extended by mobility and a new ad-hoc infrastructure based on mobile devices. In essence, mobile users are provided with data storage and processing services on a cloud computing platform rather than on the mobile devices themselves.

In particular, many delay sensitive multimedia applications require that the requested media data, such as video or image must be delivered within a certain time period and the media service requests to the cloud have to be processed before a strict time deadline. If these time requirements cannot be satisfied, the multimedia services are claimed to be failed. Therefore, the media cloud should have the capability of dealing with any failures of cloud processing, storage, and media data communications. In other words, reliability is a critical aspect of QoS for multimedia cloud services, which is the probability that the cloud computing system can provide the requested service successfully.

8 Conclusion

A combination of different approaches and algorithms can play an important role in delivering fast and intelligent video processing services for a better mobile user experience. State-of-the-art mobile video user experience enhancement techniques were combined with the cloud computing. Video stream navigation on mobile devices is eased by segment cues and tags automatically generated by intelligent processing means. Additionally, the cloud services adapt the zooming level of the video streams to overcome the problems with small screen sizes. The evaluation revealed that the utilization of a cloud environment for a parallel processing of video chunks enables near-real-time delivery of complex tasks. In the light of these findings that improvements of user experience in sharing mobile video applications have been achieved.

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